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10/809,464	03/26/2004	Hirohito Okuda	500.43701X00	7643

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EXAMINER	
PARK, EDWARD	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/809,464	OKUDA ET AL.	
	Examiner	Art Unit	
	EDWARD PARK	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 26-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 26-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This action is responsive to applicant's amendment and remarks received on 11/30/09. Claims 1-6, 26-29 are currently pending.

Response to Arguments

2. Applicant's arguments filed on 11/30/09, in regards to claim 1, have been fully considered but they are not persuasive. Applicant argues that Ko does not disclose a learning type classifier by stating that an LVQ neural network is not a rule-based classifier (see pg. 9, last paragraph – pg. 10, third paragraph). This argument is not considered persuasive since Ko discloses an LVQ neural network within pg. 94, left column, first paragraph. Furthermore, the term rule-based classifier is a broad term that the examiner is interpreting as any classifier that processes the input and designates accordingly contingent on certain criteria that is preset. It is apparent that an LVQ neural network is a type of classifier that meets this broad definition since an LVQ neural network uses certain criteria to cluster the potential input or other processes that are executed to assist the unsupervised LVQ neural network in classification. Examiner notes that the applicant is attempting to further define the rule-based classifier by illuminating an "if-then" classifier as an example; examiner recommends further defining a rule-based classifier by further amending the claim to add the "if-then" limitation or utilize a more descriptive synonym for the rule-based classifier to further clarify the cited claim limitation. Examiner notes that even

though the applicant is attempting to further define the rule-based classifier, the amendment needs to be recited within the claim language and/or clarified within the claim.

Applicant further argues that the Ko reference does not disclose a likelihood function (see pg. 10, last paragraph – pg. 11, first paragraph). This argument is not considered persuasive since pg. 94 discloses the limitation as seen below. Examiner notes that the likelihood function are the actual neural networks and classifiers as defined within Ko. The set of likelihoods are the actual outputs that the classifiers/neural networks process. Applicant argues that Ko does not disclose the two types of classification in parallel relationship with each other (see pg. 11, first paragraph). This argument is not considered persuasive since this argument was previously addressed by the non-final office action dated on 7/29/09 and the rejection can be seen within this action and the cited non-final office action.

Regarding claims 2-6, applicant argues that the claims are allowable due to the same reasons as stated within claim 1 (see pg. 11, fourth paragraph). This argument is not considered persuasive since claim 1 stands rejected and the arguments and rejection can be seen within this action.

Regarding claim 26, applicant argues that the claim is allowable due to the same reasons as stated within claim 1 (see pg. 12). This argument is not considered persuasive since claim 1 stands rejected and the arguments and rejection can be seen within this action.

Regarding claims 27-29, applicant argues that the claims are allowable due to the same reasons as stated within claim 26 (see pg. 13, second paragraph). This argument is not considered persuasive since claim 26 stands rejected and the arguments and rejection can be seen within this action.

Regarding claims 2, 3, 6, 28, 29, applicant argues the claims are allowable due to the dependency from claims 1, 26 and for the same reasons as stated within claims 1, 26 (see pg. 13, third paragraph). This argument is not considered persuasive since claims 1, 26 stand rejected and the arguments and rejections can be seen within this action.

Claim Rejections - 35 USC § 101

3. In response to applicant's amendment of claims 1-6, the previous claim rejection is withdrawn.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. **Claims 1, 4, 5, 26, 27** are rejected under 35 U.S.C. 102(b) as being anticipated by Ko et al (IEEE, "Solder Joints Inspection Using a Neural Network and Fuzzy Rule-Based Classification Method").

Regarding **claim 1**, Ko discloses a method for classifying defects using a defect review apparatus, comprising:

obtaining an image of a defect on a sample using one of an electron type image detector and an optical image detector ("three-color tiered illumination system … CCD camera"; Ko: pg. 94, right column, last paragraph);

extracting a characteristic of the defect from the image using a character extractor ("classify solder joints by color patterns obtained from a three-tiered color circular illumination system based upon a similarity measure between input data and the feature vectors of each class"; Ko: pg. 94, left column, third paragraph);

classifying the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification (see pg. 94, left column, first paragraph);

wherein the step of classifying further comprises:

calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes of the rule-based classification, by use of the extracted characteristic using a likelihood function (see pg. 94, left column, first paragraph, unsupervised self organizing neural network such as either a learning vector quantization (LVQ) neural network which is inherently rule-based since no classification algorithm can not operate or execute without rule-based);

calculating a set of second likelihoods of the defect belonging to each of a plurality of defect classes of the learning type classification, by use of the extracted characteristic (see pg. 94, left

column, first paragraph, adaptive learning mechanism can automatically select the optimal number of clusters during a learning procedure);

calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification, by use of the first and second likelihoods (see pg. 94, left column, first paragraph, after the learning procedure, a supervised learning method can then readjust the boundaries of classes like the supervised vector quantization algorithm); and

classifying the defect by use of the third likelihoods (see pg. 94, left column, first paragraph, as a result, it could improve classification performance much better than the original LVQ algorithm; able to readjust class boundaries with prior knowledge in the classification procedure); and wherein the rule-based classification and learning type classification are present in a parallel relationship with each other and independent of each other (see pg. 94, left column, first paragraph; applied both an adaptive learning mechanism and a supervised learning technique to the LVQ algorithm. The adaptive learning mechanism can ... After the learning procedure, a supervised learning method can....; Examiner notes that the term parallel relationship is interpreted as a relationship between the two techniques where the execution/processing of the techniques do not coincide with each other as further clarified with the limitation, independent).

Regarding **claim 4**, Ko further discloses wherein the plurality of classes of the rule-based classification are selected from class sets (Ko: pg. 94, left column, first paragraph) displayed on a display screen (Ko: pg. 94, right column, last paragraph).

Regarding **claim 5**, Ko further discloses the third likelihoods are calculated of by using a classification model comprising a relation of the classes of the learning type classification and the classes of the rule-based classification (see pg. 94, left column, first paragraph).

Regarding **claim 26**, Ko discloses an apparatus for classifying defects, comprising:
an imager which obtains an image of a defect on a sample ("three-color tiered illumination system … CCD camera"; Ko: pg. 94, right column, last paragraph);
a characteristic extractor which extracts a characteristic of the defect from the image ("classify solder joints by color patterns obtained from a three-tiered color circular illumination system based upon a similarity measure between input data and the feature vectors of each class"; Ko: pg. 94, left column, third paragraph);
a classifier which classifies the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification (see pg. 94, left column, first paragraph), and
a display for displaying the image of the defect and the classification result on a screen (see pg. 94, right column, last paragraph);
wherein said classifying means comprises:
a rule-based classifier which calculates a set of first likelihoods of the defect belonging to each of a plurality of rule classes by use of the characteristics of the defect using a likelihood function (see pg. 94, left column, first paragraph, unsupervised self organizing neural network such as either a learning vector quantization (LVQ) neural network which is inherently rule-based since no classification algorithm can not operate or execute without rule-based),

a learning type classifier which calculates a set of second likelihoods of the defect belonging to each of a plurality of defect classes by use of the characteristic of the defect (see pg. 94, left column, first paragraph, adaptive learning mechanism can automatically select the optimal number of clusters during a learning procedure), and

calculator which calculates a set of third likelihoods of the defect belonging to each of said defect classes and/or rule classes, by use of the first and second likelihoods (see pg. 94, left column, first paragraph, after the learning procedure, a supervised learning method can then readjust the boundaries of classes like the supervised vector quantization algorithm), and

a classifier which classifies the defects by use of the calculated third likelihoods (see pg. 94, left column, first paragraph, as a result, it could improve classification performance much better than the original LVQ algorithm; able to readjust class boundaries with prior knowledge in the classification procedure); and wherein the rule-based classification and learning type classification are present in a parallel relationship with each other and independent of each other (see pg. 94, left column, first paragraph; applied both an adaptive learning mechanism and a supervised learning technique to the LVQ algorithm. The adaptive learning mechanism can ... After the learning procedure, a supervised learning method can....; Examiner notes that the term parallel relationship is interpreted as a relationship between the two techniques where the execution/processing of the techniques do not coincide with each other as further clarified with the limitation, independent).

Regarding **claim 27**, Ko further discloses displaying a plurality of class sets on the screen, for selection of said rule classes (see pg. 94, right column, last paragraph; left column, first paragraph).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ko et al (IEEE, "Solder Joints Inspection Using a Neural Network and Fuzzy Rule-Based Classification Method") in view of Henry et al (IEEE/SEMI, "Application of ADC Techniques to Characterize Yield-Limiting Defects Identified with the Overlay E-test/Inspection Data on Short Loop Process Testers).

Regarding **claim 2**, Ko discloses all elements as mentioned above in claim 1. Ko does not disclose wherein the image is an SEM image.

Henry, in the same field of endeavor, teaches wherein the image is an SEM image ("SEM images"; Henry: section 3, first paragraph)

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Ko to utilize an SEM image as taught by Henry, to allow for more detailed, enhanced images which would enhance the detection and classification of defects.

8. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ko et al (IEEE, "Solder Joints Inspection Using a Neural Network and Fuzzy Rule-Based Classification Method") in view of Kikuchi et al (US 6,801,650 B1).

Regarding **claim 3**, Ko discloses all elements as mentioned above in claim 1. Ko does not disclose defect image is obtained while the sample is positioned in accordance with position coordinate data of the defects on the sample.

Kikuchi, in the same field of endeavor, teaches defect image is obtained while the sample is positioned in accordance with position coordinate data of the defects on the sample. ("defective position coordinate ... positions of defects on the semiconductor wafer"; Kikuchi: col. 17, lines 41-54).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Ko to utilize position coordinate data of the defects on the sample as taught by Kikuchi, to allow the "area of the semiconductor wafer under inspection [to be] in the field of view of the objective lens" (Kikuchi: col. 17, lines 41-54).

9. **Claims 6, 28, 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ko et al (IEEE, "Solder Joints Inspection Using a Neural Network and Fuzzy Rule-Based Classification Method") in view of Xu et al (IEEE, Methods of Combining Multiple Classifiers and Their Applications to Handwriting Recognition)

Regarding **claim 6**, Ko discloses all elements as mentioned above in claim 5. Ko does not disclose generating a plurality of classification models; determining a likelihood of the adequacy of each classification model; and deciding a class likelihood according to the determined model likelihood.

Xu, in the same field of endeavor, teaches a plurality of classification models; determining a likelihood of the adequacy of each classification model; and deciding a class likelihood according to the determined model likelihood (Xu: page 421, left column, lines 20-40).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Ko to calculate the likelihood of each classification class as taught by Xu, to improve the performance and reliability of individual classifiers.

Regarding **claims 28, 29**, Ko discloses all elements as mentioned above in claim 26. Ko does not disclose a computing section for calculating a likelihood of the adequacy of each of a plurality of classification models and classifies the defects by using said likelihood of the adequacy of the classification models; a computing section for calculating said third likelihood and a model likelihood of the adequacy of the individual classification models to decide a class likelihood according to the model likelihood.

Xu, in the same field of endeavor, teaches a computing section for calculating a likelihood of the adequacy of each of a plurality of classification models and classifies the defects by using said likelihood of the adequacy of the classification models; a computing section for calculating said third likelihood and a model likelihood of the adequacy of the individual classification models to decide a class likelihood according to the model likelihood (Xu: page 421, left column, lines 20-40).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Ko to calculate the likelihood of each classification class as taught by Xu, to improve the performance and reliability of individual classifiers.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EDWARD PARK whose telephone number is (571)270-1576. The examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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